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This publication contains information regarding new developments of interest to agriculture based on laboratory and field investigations by the Du Pont Company. It also contains published reports of investigators at agricultural experiment stations and other institutions as related to the Company's products and other subjects of agricultural interest.

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AGRICULTURAL NEWS LETTER

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L. F. LIVINGSTON, *Manager*

R. M. ROBERTS, *Editor*

The AGRICULTURAL NEWS LETTER serves as a medium of reporting new developments and new ideas in the field of agriculture, particularly as they are related to advancements through research. Material appearing herein may be reprinted in whole or in part, in the interest of advancing the general knowledge of new agricultural practices.

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WHAT FARM EDITORS ARE SAYING --

"Business problems, labor problems, and farm problems become totally unimportant when compared with the problem of finding a way for man to live at peace with his fellow man in a spirit of mutual good will." -- M. G. Mann, Jr., in CAROLINA CO-OPERATOR

"Researchers -- thank goodness for them -- are steadily developing new means of combating pests and diseases or of keeping them within reasonable bounds. And industry strives to supply these means of control at reasonable cost." -- Robert Couchman in WESTERN FRUIT GROWER

"Throughout the chain from seed to plate there are opportunities to do things in a better way. We have possibilities through fertilizers, crop protection, more efficient harvesting, handling, and storage, and improved food processing." -- Walter J. Murphy in JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY

"The market -- what millions of people will buy, and how much they will pay -- is the relentless and final arbiter of prices. You can hold back from it. You can put dams in its way. You can change its course. But like Ol' Man River, it keeps rolling along." -- Wheeler McMillen in FARM JOURNAL

"We take great pride in the efficient, assembly-line production of industry. Without it, the United States wouldn't be the leading country it is today. And fewer of us would have all that goes to make up our high standard of living." -- Ray Gilkeson in KANSAS FARMER

"All farmers are of necessity dual personalities -- a business manager on one hand, a skilled workman on the other. The trend of the past 20 to 30 years toward larger farms, increased mechanization and specialization have made it more profitable for the farmer to concentrate on his duties as a business man, planning, budgeting, keeping records, studying markets and economic and scientific information. In short, his time is worth more as a manager than it is as a workman." -- Gordon Monfort in FARM MANAGEMENT

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WHAT MAKES ALFALFA TURN YELLOW?

The yellowing of alfalfa and other legumes in northeastern and north central states, accompanied by the shattering of the foliage and resulting in a low-grade, stemmy hay crop, has been a major headache for hay growers for years.

Extremely dry weather has often been blamed for this loss of forage feed, but we now know that drought does not cause yellowing. A boron deficiency in the soil, if the condition is quite severe, may produce a yellowing of foliage, but too frequently the grower invests in boron, and still turns up with a yellowed crop at time of second or third cuttings.

Recent evidence charges a tiny insect, the potato leafhopper, with this damage. In fact, the feeding of swarms of these tiny insects on alfalfa leaves has been shown to cause serious loss in hay tonnage, accompanied by a greatly lowered protein and carotene content.

When insecticides to control these leafhoppers have been applied at the proper period, yield increases in dry matter have ranged from 15 to 100 per cent. Protein content in the hay has been increased by as much as 20 per cent. Carotene content in many cases has been more than doubled.

The spraying of hay lands to control leafhoppers is a relatively new practice. In areas where it has not been practiced, a demonstration plot this summer may be of benefit in illustrating the importance of this new use for insecticide. This is the sort of demonstration which lends itself quite well to a field day, when results can be shown. Where leafhoppers are a problem and are present in large numbers, the contrast between the healthy green color of the sprayed portions of the field and the yellowed plants in the unsprayed is quite striking. In most cases, too, a comparison of stems picked at random through treated and untreated areas will show a great difference in size, leafiness and color.

Just how such a summer demonstration on leafhopper control can be planned and carried out is the topic of a new "project outline" prepared by technical personnel in the Du Pont Company, who have been active in the development of forage crop spraying programs. Specific directions for applying the methoxychlor insecticide to control these insects, how to evaluate results, and even an outline on how to clean a weed sprayer so it can be safely used for spraying the hay crop are included in this outline.

County agents, instructors in vocational agriculture, 4-H Club leaders and others interested in such a summer project may secure a copy of this outline by writing the editor of AGRICULTURAL NEWS LETTER, Du Pont Company, Wilmington, Del.

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HEALTH -- AND OUR DAILY WORK

By Dr. John H. Foulger
Director of Medical Research
E. I. du Pont de Nemours & Co., Inc.

Editor's Note: The following article is excerpted from a speech by Dr. Foulger at the recent opening of the new center for the Du Pont Company's Haskell Laboratory for Toxicology and Industrial Medicine. This laboratory was founded in 1935 for rigid testing of Du Pont products and manufacturing processes to safeguard the health of both the employees producing them and the customers who use them. The work has developed now to include a major research effort in industrial preventive medicine, concerned with maintaining the health of man at his daily work. Included in the program are thorough tests of all pest control materials before they are made available for use on farms and ranches.

Most people in this world work for a living. Their working capital in the business of life may consist only of health and the ability to do a job. Health is the most important asset. However able and willing to work one may be, continued or even intermittent illness can make the greatest knowledge and the highest skill of low market value.

Health plays an important part in our national standard of living. To attain and maintain a high standard, we must have access to raw materials, the knowledge of how to convert them into useful goods and tools and capital with which to do this, a reservoir of manpower to do the converting, and markets for finished products. No one item can be omitted. The more highly a nation is industrialized the more the man actually making the goods is identical with the purchaser of those goods. The worker, himself, becomes a basic market unit. Any factor which influences his ability to obtain and to hold employment, necessarily affects both production and market. The state of health of the individual worker can be such a controlling factor.

Health as an economic force becomes more important yearly in the United States. Advances in medical science during the last quarter century have reduced infant mortality, controlled or eliminated many infectious diseases which once produced a high death rate, and greatly increased life expectancy at all ages. That portion of our population too old or too young to be employed is increasing more rapidly than that portion in the employable age range. Yet financial responsiblity for those not employed must always fall upon those who are employed, directly or through taxation. Ill health of the employed can have a disastrous result. So can ill health of unemployed dependents.

With health assuming such great economic importance, it seems axiomatic that any industry whose operations or products might offer health hazards should do everything it can to learn about them. Most tools or industrial products, if used carelessly or without adequate knowledge, can offer health hazards. An important function

of the Haskell Laboratory will always be the study of toxicity. Data on potential health hazards of new chemicals are used to write adequate precautionary labels and labeling for the Du Pont Company's products to conform to federal or state laws regulating transportation, pesticides, and industrial safety. When chemicals are intended to enter the field of food production and processing, more prolonged and detailed toxicological tests are used to satisfy regulations under the Pure Food Section of the Federal Food, Drug and Cosmetic Act.

Experience has proved that toxicological data alone are not adequate to establish a program of health conservation. To prevent injury from chemicals or manufacturing processes, we must be able to detect changes in physiology which appear before injury to the body organs or tissues. If ignorance or neglect of physiological warnings allow actual injury to occur, we have obviously failed in our duty of prevention. We have learned that at a stage at which definite injury is not yet present, entrance of hazardous chemicals into the body may cause physiological changes not related in any way to chemical structure and, apparently at least, not related to the type of organic damage which might be caused if exposure continues.

The existence of an early, non-specific physiological influence of a hazardous product brings us at once into a wide field for medical research. Those very advances in medical science which have led to control of infectious diseases and to greater longevity have brought new problems.

Since the days of Pasteur and Koch, the doctrine of a specific cause for a specific disease and specific organic damage produced by that cause has dominated medicine. So long as diseases of bacterial or parasitic origin were of major importance, this doctrine remained powerful in medical teaching and practice. But more than 20 years ago, it had been noted that the majority of patients attending clinics for diseases of the digestive tract were not suffering from specific tissue damage. Increased study of diseases of the heart and circulation has led to the same conclusion.

With major infectious diseases under control, it is now recognized that a high proportion of disabling and even fatal illness is due to the accumulating stresses of modern life. These stresses act as insults to the body physiology. The more frequent, or the more powerful the insults, the more drastic the physiological change required to combat them. Exposure to physiologically active quantities of new chemicals can be such a stress.

With this wider view of the importance of physiology, the Haskell Laboratory's program necessarily widened. To determine the conditions under which one stress -- exposure to hazardous chemicals -- might threaten health, it was necessary to take into account other stresses, industrial and non-industrial. Thus, the effects of physical labor, extremely high or low temperatures or humidities, as well as pre-existing disease, became important in selecting workers for a specific job and in protecting them while at the job.

For at least 15 years, an increasing portion of the Haskell

Laboratory's research program has been devoted to fundamental study in applied physiology. Starting often with complex situations and equally complex apparatus, we have aimed at devising simple quantitative methods which can be used frequently in industry to detect adverse trends in health.

Because in general medicine we deal so frequently now with diseases of stress, due not to one specific cause but to factors operating often over many years, it is obvious that the study of the ultimate outcome, that is, of the ill person, will not give us detailed information on the development of illness. Only by frequent study of many people, attempting to live in a modern environment, resisting or failing to resist stresses of that environment, can we learn more of what we might term the natural history of stress diseases. Industrial medical practice and industrial medical research offer an unequalled opportunity to study large numbers of people. Development of simple quantitative methods to follow trends in the physiology of those exposed to stress is fundamental to these studies.

We feel confident that the program of research undertaken by the Haskell Laboratory, closely associated with the company's central medical division and plant medical services, can contribute much to this new field of medicine.

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ARE YOU MEASURING ACREAGE THESE DAYS?

If you do have occasion to measure fields, the measuring wheel shown at left may be of particular interest. It comes in three circumferences: a two-footer for short distances over smooth terrain; a four-foot wheel for longer distances and rougher ground; a six-foot job for cross-country work and rough going. All have folding handles. The smallest one measures up to 100 feet in feet and inches, the larger models record up to 100,000 feet. Tires are of neoprene, Du Pont's chemical rubber. Its resistance to abrasion, as well as to degradation by oil, gasoline and sunlight, assures long life under the most rugged service conditions.

UREA NITROGEN YIELDS

BIGGER STRAWBERRY PLANTS

By Robert M. Hoffman, Farm Advisor, Red Bluff, California

A startling, two-way improvement in strawberry nursery stock production through the use of urea nitrogen has been observed in a series of experiments at the Wheeler Strawberry Nursery in Red Bluff, California.

These experiments showed that urea developed a larger, stronger root system and more plants per acre than ordinary ammonium nitrate, which also was used during the tests.

Urea definitely has found a place in California agriculture. This form of nitrogen is well adapted to a number of crops, a few of which include apples, citrus, most vegetables, ornamentals and strawberries.

During the 1951 and 1952 experiments at the Wheeler Nursery, two-acre blocks were set up using 180, 135 and 90 pounds of nitrogen from each of the two sources. The accompanying photographs were taken of plants from the 135-pound blocks. The comparison in root growth is quite outstanding, with at least four times the total number of roots found from the urea block. All of the plants were exactly the same age. They were taken from the mother plant as the first runner plant that developed.

The second fact that was established during the 1951 and 1952 trials was that more strawberry plants could be produced per acre through use of this new source of nitrogen.

A preliminary report issued in June of 1952 gave the results of the 1951 field trial using these same two nitrogen sources. It was found then that more plants could be produced from one source than the other.

Urea produced 739,375 plants per acre while the other source of nitrogen, ammonium nitrate, produced 479,500. The variety used in 1951 was the Lassen variety which on the whole is a much higher producer than the Shasta, used in the 1952 trials.

The 180-pound rate of nitrogen was repeated during 1952. This rate of nitrogen is normally used in Northern California for the production of strawberry plants.

Because of recent research conducted by the different University Experiment Stations and the USDA indicating that urea was a more efficient form of nitrogen, it was decided to include much lower rates of nitrogen and to find the effect of nitrogen on plant production

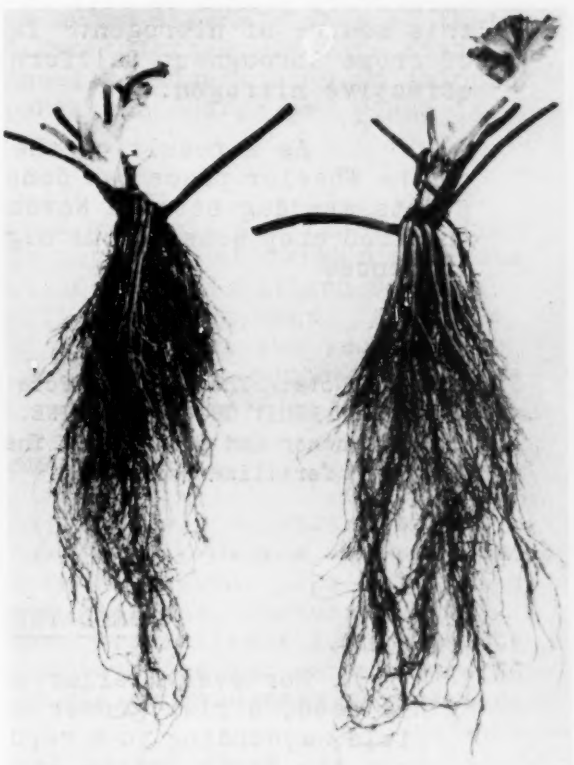
alone. Therefore, with the 180-pound rate there was also 135 pounds per acre and 90 pounds of nitrogen per acre.

All of these applications were made through the sprinkler system injected into the main line with a commercial fertilizer injector and run for a two-hour period during injection. Each of the urea applications was made on a 24-day interval. The ammonium nitrate applications were made on three occasions, also through the sprinkler system.

In the final analysis not only did the number of plants vary with the different amounts of nitrogen applied, but the response to the different source of fertilizer as well. By August 1, after an April 1 planting, the urea blocks of 180 and 135 pounds had completely covered the ground. It was not until after September 1 that the ammonium nitrate 180-pound block covered the soil.

There were more runner stems produced faster. The runner stems were larger in diameter and tended to appear much more vigorous throughout the season. Other factors displaying vigor were larger

These young strauberry plants are representative of those receiving 135 lbs. of nitrogen as ammonium nitrate per acre.



The heavier root grouth evident here is characteristic of those receiving 135 lbs. of nitrogen as urea per acre.

leaves, showing a very deep green appearance and longer internodes between plants.

Counts from 1952 Trials -- Shasta Variety

Source	Nitrogen in Pounds per Acre	Plants Produced per Acre
Urea	180	512,000
Urea	135	442,000
Urea	90	365,000
Ammonium Nitrate	180	450,000
Ammonium Nitrate	135	396,000
Ammonium Nitrate	90	315,000

It is interesting to note there were almost as many plants from the 135-pound urea block as there were from the 180-pound block of ammonium nitrate.

As a result of higher production by using urea, growers of strawberry plants as well as strawberry fruit producers should consider this source of nitrogen. It would be well for producers of all types of crops throughout California to investigate the possibility of this effective nitrogen.

As a result of the 1952 trials, all of the 1953 production on the Wheeler place was done using urea as a source of nitrogen. The plants are dug between November and January and from the harvest of the 1953 crop season, the higher developed root system is certainly in evidence.

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Editor's Note: The above article and pictures were adapted from a recent issue of WESTERN FRUIT GROWER MAGAZINE. They are presented here through the permission of both author and publisher. The urea used in these tests was in the form of "NuGreen" fertilizer compound.

SEED TREATMENT PAY-OFF IN FLAX

For every dollar spent for mercurial fungicides to treat his seed, a flax grower may reap $75 in profits from additional yield, according to a report in CROPLIFE magazine, based on data from the North Dakota Agricultural College Experiment Station. Tests there last year showed an increased yield from treated flax of nearly three bushels an acre over non-treated. An experiment station in Iowa ran a three-year test and found an average of 1.4 bushels per acre more crop from treated seed.

"THE CARE AND FEEDING OF LIVESTOCK PARASITES"

By Dr. D. C. Boughton

In order to properly discuss this subject I must create a new science -- economic parasitology. You are familiar with economic entomology, whose disciples are able to predict the time and place of grasshopper plagues and the northern march of the screw-worm fly. Without losing sight of significant details of insect structure and physiology, economic entomologists have somehow learned to scan large geographical areas and to recognize their insects as invading hordes capable of causing measurable destruction. Some day I shall take time out and try to determine why there aren't more economic wormologists.

Let's see what the economic parasitologist would do with the large roundworm of swine, Ascaris. He would first get the figure for swine in the United States -- 54 million -- and, second, a conservative estimate of average parasite load -- 10 worms. Now he sharpens his pencil and loosens up his slide rule. Fifty-four million times ten is 540 million worms. At 10 grams per worm, we have over 10 million pounds of roundworm in the United States. This is only a modest poundage as modern production goes these days but a sizeable crop at that when one stops to think it was produced from microscopic eggs with ordinary swine rations. Much of the annual roundworm crop is shipped to market with the hogs, and the transportation charge per pound is as much for worm as it is for hog.

But our statistics-minded parasitologist is just getting warmed up. He learns that a happily mated and well-fed female roundworm gives forth 200,000 microscopic eggs per day. Allowing a moderate reproductive period of 150 days for each of the 270 million females, we get an annual production of eight million billion eggs. A single egg weighs less than one-10-millionth of a gram, but the year's crop comes to over 700 tons, or nearly three million eight-ounce cans, if we were to pack it like shad roe.

Worm Rations

At this point we have something tangible to work with -- 10 million pounds of reproducing worms. Obviously this living mass requires food for growth, maintenance, and reproduction. Its food comes ultimately from the feed the farmer feeds his hogs, because during adolescence and sexual maturity these worms are entirely surrounded by pig. No one knows exactly the feed consumption for our annual ascarid crop, but if it were 10 million pounds of pig we were raising instead, we'd need 20,000 tons of feed.

But parasites do more than eat and reproduce. They damage their hosts in various ways: Retarding growth, producing pathological symptoms and disease, and sometimes killing them outright. This damage is what has been so hard to measure and to correlate with parasite numbers, except when, for example, a parasite outbreak lays out dead pigs for us to count. Invading larval worms attack the lungs and wreck the liver. Labored breathing and harsh coughing are characteristic

of this invading phase of infection. Pneumonia often follows. Adult worms disturb digestion by blocking the intestine or clogging the bile ducts. They are known to go berserk and to perforate the intestine -- dragging bacteria into the body cavity, causing peritonitis.

But most important from the overall economic standpoint is the fact that worm infections retard growth -- that they cause unthrifty pigs. In a way, it's a pity the injuriousness of parasites isn't expressed oftener in more spectacular fashion. Parasitic disease, being insidious, is too easily overlooked as a cause of unthriftiness. Nearly all pigs in a herd are likely to be parasitized at one time, and there is no sharp contrast between sick and well to catch the raiser's eye. When a farmer's pigs are neither sick nor well and he himself has probably never seen a parasite-free herd anyway as a basis for comparison, he is apt to accept mediocre growth for good and fail to recognize his loss, to say nothing of its cause. I believe that when we are better able to measure unthriftiness in dollars lost through wasted feed, time and labor, more swine raisers will be shocked into realizing that worm raising is a highly unprofitable and very silly occupation.

USDA Experiment

Dr. L. A. Spindler of the USDA took a healthy swing at answering the question as to what extent large roundworms inhibit the growth of pigs. I want to summarize his observations briefly. Eight littermate, worm-free weanlings were kept in separate pens; four were fed infective ascarid eggs and four were kept as untreated controls; the pigs were observed for four months and then were weighed, slaughtered, and examined for parasites. At the end of the experiment the four uninfected pigs, as expected, had no worms; the four infected pigs harbored, respectively 12, 20, 39, and 109 ascarids.

The uninfected pigs made relatively good weight gains during the test -- an average of 0.8 pound per day. The weight gains of the infected pigs were definitely not this good -- and the point of particular interest is that they get worse the more parasites are present. The actual figures were as follows: The pig with 12 worms gained 0.7 pound per day (the controls, remember, gained 0.8 pound); the pig with 20 worms gained 0.5 pound per day; the pig with 39 worms gained 0.4 pound per day; and the pig with 109 worms had a net loss of eight pounds at the end of the experiment.

It should be of special note that when as few as 20 to 40 worms were found, average daily gain was only half what it should be and each worm cost the grower 1.6 pounds of weight gain during the four-month growth period.

Cattle Parasites

Now I'd like to consider our 93 million cattle and their gastrointestinal nematode worms, the average infection being estimated at 1,000 of these almost microscopic little beasts. It takes about 2,000 to make up the weight of one pig worm, but even so our annual cattle worm crop comes to over 800,000 pounds. These bantam weights are prolific and shower our pastures with 180 tons of their microscopic eggs annually. This same tonnage in chicken eggs would require the full

production for one year of 15,000 modern, 200-egg hens -- and 500 tons of poultry feed. However, wild female worms are apparently much less efficient than contented hens and require 50 pounds of solids to produce a pound of egg. On this basis, female worms alone consume 9,000 tons of solids. Adding two-thirds as much for the male worms gives 15,000 tons. This tonnage in livestock feed would cost over $1,000,000.

The board bill is actually much greater than this, because, rather than feed parasites out of the feed bag, we manufacture their special diet in the course of the expensive process of making cattle blood and tissue. If only half the worms in the average infection are blood suckers and tissue eaters and each such worm removes only one cc. of blood or its tissue equivalent per year, then the loss is one pound per head or a total loss in this country of 93,000,000 pounds. I estimate a production cost of 30 cents per pound for good fresh cattle blood and intestinal mucosa. This makes the annual board bill $28,000,000.

These figures on the weight of living worms and worm eggs and on what it costs to feed our annual crop of cattle worms -- challenging as they may be in their own right -- are presented here primarily to emphasize the magnitude of the living, parasitic force with which the cattle industry must contend. It is obvious that all infections are not average and that heavier infections take a greater than average toll -- some herds get by with the loss of a few pints of blood while others suffer severe damage. The total damage done by parasites, as with Communists, is very difficult to measure.

The Remedy Too Late

Heavy infections of gastrointestinal parasites cause obvious disease and economic loss within the infected herd. The owner of a severely infected herd is easily convinced to treat and set up preventive measures, often, unfortunately, only after he has already sustained a sizeable loss.

As is the case with swine, however, the widespread unthriftiness due to low-grade parasitic infections is not easily recognized. The cattle industry has been slow in taking up the fight against parasites, primarily, I believe, because the infections in cattle are not as likely to produce spectacular symptoms as are those in sheep, for example. In many parts of the world sheep raising would be unprofitable, if not impossible, without worm control. Therapeutic treatment and continuous free-choice medication are part and parcel of sheep husbandry today.

The sheepman was convinced because he was kicked in the pocketbook by something he could see -- because he himself could directly relate death and morbidity in his flock with financial loss when he failed to practice worm control. I have little doubt that cattlemen today would be doing as good a job of parasite control as sheepmen had they been as severely shocked into a realization of its importance.

Proof of Loss

The young science of economic parasitology, however, is

bringing to light a large economic loss resulting from what has up to now been shrugged off as mild parasitism. The practical result of this is, because there is already available an inexpensive means of control, that we can show cattlemen how to make more money right now.

The experiments are simple in design. Beef herds with various levels of parasitic infection are divided into two equal parts. One half is either given a single therapeutic treatment or a treatment followed by a regimen designed to drastically reduce reinfection. The other half serves as the untreated, unprotected control. Weight gains of the two groups are compared. The results are superior weight gains in the treated, protected groups -- added beef giving a substantial profit above and beyond the cost of parasite control. A series of tests averaging four months in length showed an average extra gain of one-fifth pound per head per day. In growing cattle, this bonus gain represents an extra profit of more than $10 per head per year.

We have become accustomed to raising our cattle and their parasites together as one operation, and our experience in cattle growth and health is in terms of parasitized animals. The latter are often taken as optimal, which they surely are not, and we seldom observe the full potential of truly non-parasitized stock.

The Antibiotic Experience

A good illustration of how potential can be obscured by low-grade infection is found in swine. Recently antibiotics have been shown to promote pig growth when fed at low levels. The most plausible explanation for the beneficial effect is that the drugs, by suppressing certain types of bacteria in the digestive tract, eliminate low-grade, sub-clinical infections ordinarily present in apparently healthy pigs. The nutritionist thus happened upon a cure for a previously unrecognized condition. He got the growth boost he was looking for, but he did it by removing the drag due to an infection. The economic significance of the infection came to light only after the growth rates of treated and untreated pigs were compared.

As I have indicated, this is just what is happening with cattle parasites. Phenothiazine is the drug involved. Its proper use gives better growth in many herds even when parasitism is not obviously a problem. It knocks out the low-grade infections and protects against reinfection, thus permitting a fuller expression of growth potential.

Phenothiazine has one property of particular significance in this regard, namely, when fed at low levels to sheep and cattle, it suppresses egg production of female worms and inhibits development of eggs that are passed out onto the pasture with the droppings. This property, coupled with its ability to remove adult worms when given at therapeutic levels, makes phenothiazine particularly effective in parasite prevention programs.

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Editor's Note: The above article was condensed from an address by Dr. Boughton before a recent meeting of Livestock Conservation, Inc.

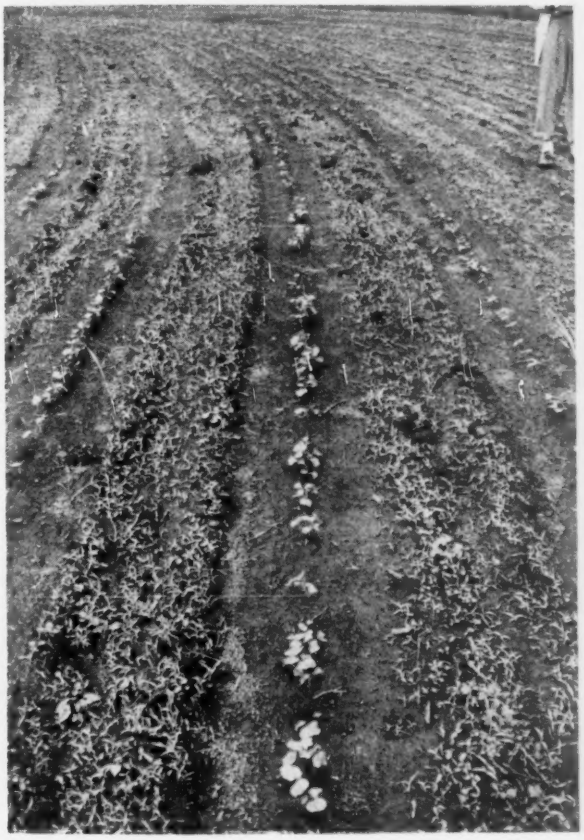
AN EFFECTIVE NEW WEED KILLER FOR COTTON GROWERS

The hoe, as a tool for weeding cotton, has been passing out the past several years, as newer, better, and safer chemicals for the control of weeds have made their appearance.

This year the newest, and one of the most extensively tested weed killing compounds yet developed is being made available for the first time to southern cotton growers. It is known as "Karmex" DL herbicide and is one of the family of substituted urea compounds developed through Du Pont research. Supplies are limited and it is certain that growers using this new material will have a lot of visitors dropping by to see how clean it keeps the cotton patch, since a great deal of interest in its effects has been shown throughout the cotton belt.

"Karmex" DL is based on a compound known chemically as 3-(3,4-dichlorophenyl)-1,1-dimethylurea, a close relation to 3-(p-chlorophenyl)-1,1-dimethylurea, which was previously abbreviated as CMU and is now known in its commercial formulation as "Karmex" W herbicide. In 1952, both these materials were under evaluation as cotton herbicides. Comparative box scores were kept

Close-up of cotton plants, about four weeks after planting. "Karmex" DL herbicide was applied in a one-foot band over the row at planting time. Equipment of the sort used in applying the weed killer is pictured on page 55.



Here's a study in uniform weed control resulting from pre-emergence application of "Karmex" DL herbicide in a band over the row. Note weed growth between rows, where chemical was not applied.

as to their relative merits, and when the data were analyzed it seemed quite evident that the dichloro compound had scored over the p-chloro material in the matter of both effectiveness and freedom from injury to the cotton plants.

In 1953, these two compounds were again under test in southern cotton fields.

In addition to Du Pont tests and experimental station evaluations last year, a total of 72 tests in cooperation with cotton growers were carried on in 11 southern states. These tests were conducted using the farmer's own equipment for application, operated in most cases by the grower or a hired hand, and in diverse enough locations to obtain a good cross-section of cotton growing conditions without attempting to select for such factors as rainfall, soil types, or cotton varieties.

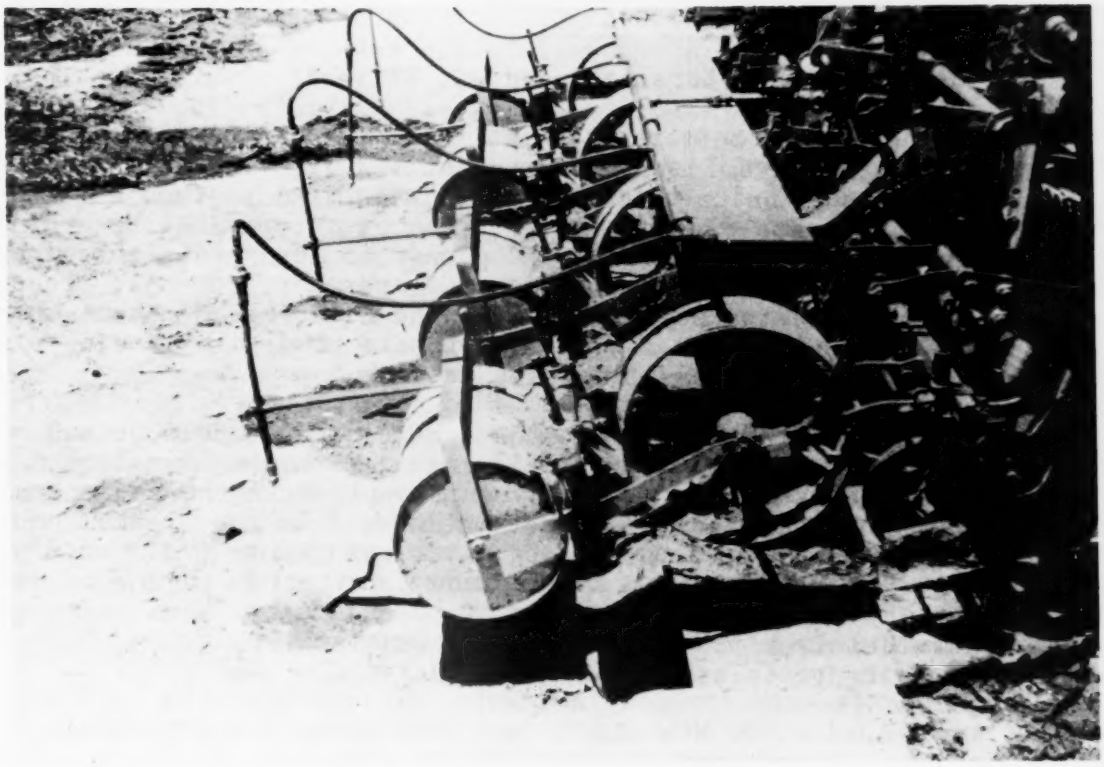
In most cases, two- or four-row equipment was used by the growers in applying these pre-emergence treatments. Those growers who had previously used pre-emergence herbicides on cotton usually had planter-sprayers available which permitted planting and spraying in one combined operation. In areas where pre-emergence herbicides had not been used extensively, applications were made with assembled rigs, such as insecticide sprayers, using in some cases the less desirable procedure of applying the chemical in an operation separate from planting.

Each sprayer was slightly modified to assure the satisfactory application of the formulations being used. All nozzle strainers were of 50-mesh or coarser, and a simple jet arrangement was installed at the end of the by-pass hose. Use of these jets under a minimum of 15 pounds of pressure on the by-pass line gave adequate agitation of the spray mixture. Each sprayer was also calibrated to determine the gallons per acre delivered. As a check, actual gallons applied were compared with the acres treated.

Weed control counts were made from three to five weeks after treatment and wherever possible at 10 weeks after treatment, then again at harvest. Weed control with the dichloro compound was excellent at the 1.6 pounds per acre rate, and only slightly less effective at the 1.2 pounds per acre rate. In the 72 tests, only two cases were reported where the crop stand was appreciably lowered, and both these instances were at the 1.6-pound rate.

As 10 to 30 per cent of cotton acreage is normally replanted due to weather conditions, the effect of the dichloro compound on the replanted crops was noted whenever replanting was required. In eight tests which were replanted, no stand reduction and no more than slight chlorosis was noted where the dichloro compound was used.

Along with the evaluation of both these chemicals for weed control and possible plant injury, studies were also carried on to determine the residual effect of these herbicides in the soil. On the basis of chemical and bio-analyses, it was concluded that both the compounds, when applied at rates of one, two, or four pounds per acre,



A typical combination planter and sprayer of the type used in many of the cooperative grower tests to evaluate "Karmex" DL herbicide for cotton weed control.

basis of chemical and bio-analyses, it was concluded that both the compounds, when applied at rates of one, two, or four pounds per acre, as a blanket treatment, were reduced to innocuous levels in each soil type at four to 12 months after initial application.

Laboratory studies were also conducted to evaluate the effect of a temperature differential and a sterility differential on the residual activity of these compounds. Their effects disappeared more rapidly in soil samples stored at 80°F. than in samples stored at 41°F. Further, treated soil samples which were stored for six weeks under sterile conditions retained the initial toxic effects of the chemicals, while treated samples stored under non-sterile conditions showed a marked reduction in the toxicity of both herbicides. These results indicate that soil microbes play a role in the disappearance of these urea herbicides.

On the basis of this data, a 30 per cent liquid suspension of the dichloro compound -- "Karmex" DL herbicide -- has been given the nod for grower use in 1954. It is being recommended for application at the rate of one and an eighth pounds per acre (blanket basis) for pre-emergence use on the cotton fields.

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"THIRAM FOR SMUT CONTROL IN ONION SET PLANTINGS"

R. H. Larson* and J. C. Walker**

Most of the better upland soils in the Racine-Kenosha area of Wisconsin are contaminated with the smut fungus, and with many successive crops of onion this fungus has increased to such an extent that without adequate control measures, onion sets cannot be grown profitably. In set culture about 70 pounds of seed are planted per acre, as compared with four to five pounds per acre for bulb production. In smut-infested soil planted at the higher seed rate a thin, irregular stand occurs and low yields of sets of desirable size with a large percentage of over-size bulbs results.

The standard method of smut control in set culture has been application of commercial formaldehyde. From a tank attached to either tractor or seeder, the solution is applied in the seed furrow ahead of the covering blades. Objections have been the special equipment required, labor involved hauling water and making up the solution, regulation of the flow to the proper amount per acre, injury to seedlings under dry conditions, reduction of effectiveness when heavy rain follows immediately after planting, and occasional plugging of the seed spout owing to splashing of the solution.

In 1944 A. G. Newhall in New York announced a new method of control which consisted of stirring the seed with a five per cent solution of methyl cellulose and then coating with a given amount of thiram. Best results were obtained with about one pound of the fungicide pelleted on one pound of seed when the bulb production rate of about five pounds of seed per acre was used. Experiments with thiram applied to seed sown at the 70-pound seed rate for onion sets were begun in the Racine-Kenosha area in 1946 and continued through 1951. Preliminary reports have been published.

TABLE 1. -- Comparison of onion smut control with standard formaldehyde-drip treatment and with various amounts of thiram applied to the seed, 1946.

Treatment	% Diseased Plants
NONE	49.8
Formaldehyde 1 pint-16 gallons-2400 feet	4.3
1/10 pound thiram to 1 pound seed (no sticker)	3.8
1/8 pound thiram to 1 pound seed plus sticker	9.8
1/4 pound thiram to 1 pound seed plus sticker	2.5
LSD*** 99:1	4.6

EXPERIMENTAL RESULTS -- Thiram in the form of 50 per cent tetramethylthiuram disulfide ("Arasan" seed disinfectant)**** was

* Division of Vegetable Crops and Diseases, U. S. Department of Agriculture
** Department of Plant Pathology, University of Wisconsin, Madison, Wisc.

applied in various amounts to onion seed with or without methocel sticker. The latter was applied according to the method of Newhall. Treated and untreated seeds were sown at the 70-pound rate in random order in four replicate blocks on naturally infested soil. Random samples of seedlings from each treatment in each replicate were removed and sorted, and the percentage of diseased plants was determined when lesions from early infection had reached full development and before infected seedlings had begun to die and disappear.

Results of the 1946 experiment are in Table 1. With the 70-pound seed rate the control with 1/10 pound of thiram to one pound of seed without sticker was equal to that with the standard formaldehyde treatment. When 1/8 pound of thiram was used per pound of seed with sticker, the percentage of diseased plants was significantly higher. When the rate with sticker was increased to 1/4 pound, the percentage of diseased plants fell to approximately the same level as with the 1/10 pound rate without sticker. This difference was interpreted as probably owing to the fact that the sticker inactivated a certain amount of the thiram. Results indicated that with the heavy seed rate enough thiram was supplied at the rate of 1/10 pound per pound of seed. Furthermore it was indicated that the use of thiram at this rate would be more effective without sticker than with it.

TABLE 2. -- Comparison of onion smut control with standard formaldehyde-drip treatment and with 1/10 pound of thiram per pound of seed with and without sticker on basis of per cent plants diseased.

	Percentage of diseased plants in treatment indicated				
			Thiram		
Year	None	Formaldehyde	With sticker	Without sticker	LSD*** 99:1
1947	46.8	4.4	12.0	3.8	4.9
1948	88.4	7.3	11.6	3.3	1.1
1949	80.1	6.3	12.7	4.9	2.4
1950	80.4	6.1	8.8	3.5	1.1
1951	89.3	7.9	13.0	4.0	1.4
5-year average	77.0	6.4	11.6	3.9	

During the next five seasons (1947-1951), experiments were confined to comparisons of standard formaldehyde-drip treatment with 1/10 pound thiram per pound of seed with and without sticker. Results are in Table 2. In each of the five seasons thiram without sticker was more effective than formaldehyde; in three of the five seasons the differences in percentage of diseased seedlings were highly significant. On the contrary when sticker was used with the same amount of

thiram, the percentage of diseased plants was in each season significantly greater than in the formaldehyde treatment.

The use of 1/10 pound thiram (in the form of "Arasan" seed disinfectant) without sticker per pound of seed came into general use in the Racine-Kenosha area during the course of these experiments. In 1952, four large commercial fields known to be heavily infested with the smut organism and sown with seed treated with thiram were surveyed for occurrence of disease. The highest percentage of diseased plants recorded was 3.6.

Whether at the high seed rate for sets a smaller amount than 1/10 pound of thiram to one pound of seed is adequate has not been determined. Results reported herein show that in set production when the thiram is applied at 1/10 pound rate, smut is controlled effectively without use of sticker and without any special equipment.

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*** Data from untreated plots were not included in analysis of variance.
**** The new dustless form of this material, known as "Arasan" SF-X, is not recommended for use at the rates of application discussed here.

Above article was condensed from PHYTOPATHOLOGY (Vol. 43, No. 11), official organ of the American Phytopathological Society.

METHIONINE TESTED IN TURKEY RATIONS

The addition of free methionine to turkey growing rations has produced faster growth in birds up to 14 weeks of age and has invariably resulted in improved efficiency of feed utilization. Such is the evidence in a series of tests conducted in Texas, Washington, Delaware, Idaho, and in Ontario, Canada.

The over-all results show increases in profit amounting to between two and 30 times the cost of the methionine used, in the seven experiments reported thus far. Data from these tests show large benefits from the use of methionine up to eight weeks. In the two experiments which were carried on for 14 weeks, methionine still continued to give favorable responses. Basal diets in all these tests contained methionine in amounts well above the accepted requirements for poults (0.45%) yet in each case the addition of free methionine gave marked growth increases.

Tests on the effects of this essential amino acid as a supplement to turkey rations are continuing. Meantime, anyone wishing copies of data from the seven tests referred to above may secure a report from the editor of AGRICULTURAL NEWS LETTER, Du Pont Company, Wilmington 98, Del.

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LOOKING INTO THE FUTURE OF

THE FRESH PRODUCE BUSINESS

What will the future bring in the field of harvesting, packing, shipping, and selling fresh produce?

At the request of the United Fresh Fruit & Vegetable Association, during their 1954 convention in Chicago, Albert S. Allen, technical representative of the Du Pont Company's Film Department, tried a little crystal ball gazing in an address before that group. Here are the predictions he came up with:

"You can expect to see a much wider use of refrigeration. An example is the announced development of a portable vacuum cooling apparatus which can be moved from field to field.

"When refrigeration is available from field to home kitchen -- from the grower to the ultimate consumer -- you will probably see packaged as fresh such items as shelled peas and lima beans.

"You should see more and more use of automatic vending machines to sell fruit much more widely than has ever been done before. As an example, one large railroad is trying automatic vending machines on trains to supplement or replace dining car service.

"With the increase of refrigeration and improved handling techniques, you are going to see more tree-ripened or more nearly mature fruits moving to market protected by packaging.

"With improved handling techniques, the vitamin level and freshness of the produce will in turn be improved, thus winning more customers for fresh produce.

"I am sure that the packaging film industry will be helping to bring these things about."

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OHIO TOMATO CHAMP TELLS PROCEDURE

How do you grow 24 tons of tomatoes per acre? Here's the way Chester Mauch of Lindsay, Ohio, champion grower in the Buckeye State's Top Ten Tomato Club did it last year:

Mr. Mauch planted his tomatoes on a dark sandy loam, enriched with 10 loads of manure per acre during the winter. In the spring he plowed under 900 pounds of commercial fertilizer per acre, then used a high phosphorus starter fertilizer in the transplanter water. He planted Early Reds from a local greenhouse on May 20, setting them 3½ feet apart in rows five feet apart. To control diseases, he sprayed five times during the season with "Manzate" fungicide.

* *

EXPERIMENTERS' NOTATIONS

A Round-up of Data From Across the Nation

About a half-million acres of grain and hay land were sprayed during May and June last year in Ohio to control armyworm and spittlebug. The value of grain saved and increased hay tonnage resulting from this spraying is conservatively estimated to be in excess of $5,000,000, according to T. H. Parks, extension entomologist.

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A new soil test developed at University of Wisconsin will show how much available nitrogen is in a given soil. A chemical reaction with alkaline permanganate which liberates ammonia is the basis for the test.

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Reporting on tests with several insecticides for control of southwestern corn borer, L. H. Rolston, entomologist at Arkansas Agricultural Experiment Station, reported that the only material that performed satisfactorily and did not injure the plants was EPN. It was applied at one pound active ingredient per 100 gallons of water, four times over a 17-day period.

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Recent reports on disease control work have supplied a number of new testimonials on the effectiveness of the dithiocarbamate fungicides. In Rio Grande Valley of Texas, dusting programs using eight per cent formulations of either "Parzate" or "Manzate" fungicides doubled spinach yields through control of white rust and blue mold. In South Carolina, six or eight per cent "Manzate" dusts at five-day intervals gave the best control of cucumber diseases of any fungicide tested for the third consecutive year. In North Carolina, use of either nabam or zineb was found to control scab of summer squash. At Oregon Experiment Station, Dr. E. K. Vaughan has found that ferbam at the rate of 1½ pounds per 100 gallons of water gave good control of blackberry rust. In the middle-Atlantic states, "Zerlate" fungicide at the rate of three pounds per 100 gallons (300 gallons per acre) has been recommended for the control of mummy berry on blueberries. L. O. Weaver of the University of Maryland says zineb gives good control of sooty blotch and frog-eye spot of apples, and may also be of some value against fire blight.

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Speaking of the dithiocarbamates, here's one that seems to have insecticidal properties. In tests at New Mexico Experiment Station, "Parzate" fungicide seemed actually toxic to Mexican bean beetles. When it was incorporated in a rotenone dust at 10 per cent by weight, the rotenone could be decreased to as low as 0.1 per cent. One per cent parathion also afforded excellent control when it was used with "Parzate."

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